BS EN 16094:2012

BSI Standards Publication

Laminate floor coverings — Test method for the determination of micro-scratch resistance

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 16094:2012.

The UK participation in its preparation was entrusted to Technical Committee PRI/3/60, Textile & Resilient Floor Coverings.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 70634 9

ICS 97.150

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 January 2012.

Amendments issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16094

January 2012

ICS 97.150

English Version

Laminate floor coverings - Test method for the determination of micro-scratch resistance

Revêtements de sol stratifiés - Méthode d'essai pour la détermination de la résistance aux micro-rayures

Laminatböden - Prüfverfahren zur Bestimmung der Mikrokratzbeständigkeit

This European Standard was approved by CEN on 26 November 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 16094:2012: E

Contents

Page

Foreword

This document (EN 16094:2012) has been prepared by Technical Committee CEN/TC 134 “Resilient, textile and laminate floor coverings”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

1 Scope

This European Standard specifies a test method for the micro-scratch resistance which can be used for all types of laminate floor coverings.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20°, 60° and 85° (ISO 2813)*

EN ISO 12945-2, *Textiles — Determination of fabric propensity to surface fuzzing and to pilling — Part 2: Modified Martindale method (ISO 12945-2)*

EN ISO 12947-1*, Textiles - Determination of the abrasion resistance of fabrics by the Martindale method — Part 1: Martindale abrasion testing apparatus (ISO 12947-1)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
cycle
completion of all the translational movements tracing a Lissajous figure comprising 16 rubs

NOTE This comprises of 16 revolutions of the two outer drives and 15 revolutions of the inner drive of the Martindale tester.

3.2
Lissajous figure
figure created by movement which changes from a circle gradually narrowing ellipses, until it becomes a straight line, from which progressively widening ellipses develop, in a diagonally opposite direction before the pattern is repeated

3.3
rub
one revolution of the two outer drives of the Martindale tester

4 Principle

The sample is fixed on a horizontal table. A circular scrub material fixed on a holder impacts on the sample with a defined load. Table and holder are moved perpendicular to each other in a translational movement, with defined frequencies, tracing a Lissajous figure. The holder is additionally freely rotatable around its own axis perpendicular to the horizontal plane.

The sample is exposed to the scrub material for a predetermined number of rubs. The changes of the surface are determined by gloss measurement and visual assessment.

5 Apparatus and materials

5.1 Martindale tester: The Martindale tester shall be as described in EN ISO 12947-1 with the following exceptions:

— the “abrading table” is the table for the sample;

— the “clamping ring and mechanism” is not necessary;

— the “specimen holder” is the holder for the scrub material;

— the “loading pieces” are not necessary.

5.2 Holder for scrub material: The holder for scrub material shall be as described in EN ISO 12945-2, with the following exceptions:

— version 1: the rubber retaining ring is not required. This assembly consists of spindle, scrub holder and small ring weight. The total mass of this assembly is (413 ± 2) g (nominally called 4N);

— version 2: the assembly according to version 1, however the small ring weight is replaced by the large weight. The total mass of this assembly is (612 ± 2) g (nominally called 6N).

5.3 Diffuse light source: Light source providing evenly diffused light giving an illumination on the test surface of (1 200 ± 400) lx. This may be either diffuse daylight or diffuse artificial daylight.

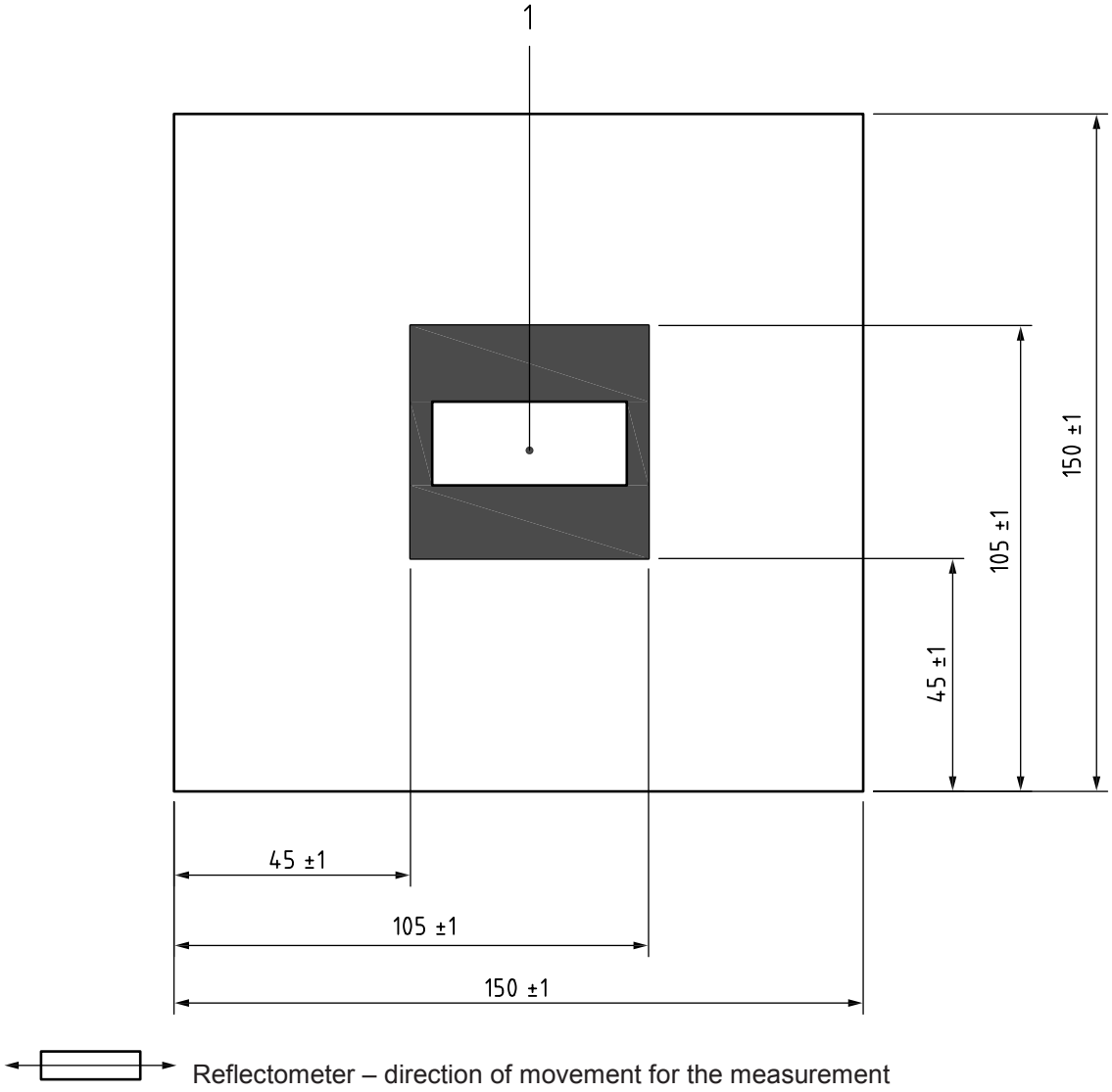
The daylight should be unaffected by surrounding trees, etc. When artificial daylight is used, it is recommended that it should have a correlated colour temperature of (6 500 ± 50) K and an R_a greater than 92, by using a colour matching booth in accordance with EN ISO 3668:2001 [1].

5.4 Reflectometer: For gloss measurement with 3 angle measurement geometry as described in EN ISO 2813.

5.5 Positioning device: For gloss measurement on the same position before and after the test with 4 measurement points.

An example of a positioning device is shown in Figure 1.

Dimensions in millimetres



Key

1 measurement area

Figure 1 — Sample with measurement area for the 4 gloss measurement points

5.6 Scrub materials: The scrub material shall be a nylon web imbedded with alumina abrasive. Two types of scrub materials (very fine and medium fine) are to use. The scrub materials shall be cut or stamped on a diameter of (89 ± 1) mm.

NOTE Scotch Brite fleece SB 7447 (very fine) and SB 7440 (medium fine) are examples of a suitable product available commercially. This information is given for the convenience of users of this European Standard and does not constitute an endorsement by CEN of this product.

5.7 Double-sided tape: The double-sided tape is to attach the scrub material on the guide plate of the holder and the sample on the table.

5.8 Soft cotton cloth: The soft cotton cloth is for cleaning of the samples before and after the test.

6 Assembly and maintenance of the Martindale tester

The assembly of the tester shall be carried out in accordance with the instructions of the apparatus manufacturer. For the described test, the outer position C shall be used for both axes to create the larger Lissajous figure as explained in EN ISO 12947-1 or the manufacture guidebook.

The checking of the Lissajous figure shall be done according to Annex A.

7 Preparation and conditioning

7.1 Preparation

Six samples with the dimensions of 150 mm × 150 mm shall be prepared. The surface of the samples shall be substantially flat.

If the panel width is smaller than 150 mm, assemble a sample of two parts with length joint in the middle.

7.2 Test surface

Conditioning of test surface shall begin at least one week before testing and shall be carried out in air at a temperature of (23 ± 2) °C and relative humidity of (50 ± 5) %.

8 Test procedure

8.1 General

Two different procedures (A / B) are described. All the necessary parameters (scrub material, load, speed factor, number of cycles) are shown in Table 1.

Table 1 — Test procedures for determination of resistance to micro scratches

Test parameter	Procedure A	Procedure B
Scrub material	Very fine	Medium fine
Holder for scrub material	Version 2 (Sample holder plus large weight)	Version 1 (Sample holder plus small weight)
Speed factor	1	1
Number of rubs	80 rubs (= 5 Lissajous movements)	160 rubs (= 10 Lissajous movements)
Assessment	Gloss change	Visual according to Annex B

8.2 Testing

8.2.1 Procedure A

Immediately after conditioning, the test shall be carried out in a test temperature of (23 ± 2) °C at 3 samples.

Before starting the test, the samples shall be cleaned with a soft cotton cloth (5.8).

Before the test, 4 gloss measurements on each sample using the reflectometer (5.4) with a geometry of 60° and the positioning device (5.5) shall be carried out. If there is a decor or preferential structure direction or a joint on the sample the measurement shall be done parallel to this direction. Calculate the mean value for each sample.

The gloss measurement on samples with a joint has to be made at least 5 mm away from the joint.

If the mean value is higher than 70 (high gloss surface), four additional measurements with the 20° geometry shall be carried out.

NOTE Polishing effects on mat surfaces (R' < 10) can be assessed by use of the 85° geometry.

Fix the sample on the table of the Martindale tester using the adhesive tape (5.7). The very fine scrub material (5.6) shall be fixed with the adhesive tape on the guide plate of holder.

Select 80 rubs on the counter of the Martindale device and start the test.

After finishing, remove the sample from the table and clean it with the cotton cloth (5.8). Remove also the used scrub material.

Measure the gloss again with the chosen geometry according to the above-described procedure.

Calculate for each sample the gloss change $\Delta R'$ according to the following equation:

$$\Delta R' = \frac{(R_I - R_F)}{R_I} \times 100\ \%$$

where

R_I is the mean value at initial state;

R_F is the mean value after finishing the test.

Calculate the mean value of the gloss change of the 3 samples and round it on the next integral number. Classify the results according to Table 2.

Table 2 — Classification of mean values of gloss change

Microscratch resistance class according to procedure A	I Change of gloss I
MSR-A1	≤ 10 %
MSR-A2	> 10 % to ≤ 30 %
MSR-A3	> 30 % to ≤ 50 %
MSR-A4	> 50 % to ≤ 70 %
MSR-A5	> 70 %

8.2.2 Procedure B

Immediately after conditioning, the test shall be carried out in a test temperature of (23 ± 2) °C at 3 samples.

Before starting the test, the samples shall be cleaned with a soft cotton cloth (5.8).

Fix the sample on the table of the Martindale tester using the adhesive tape (5.7). The medium fine scrub material (5.6) shall be fixed on the guide plate of holder with the adhesive tape.

Select 160 rubs on the counter of the Martindale device and start the test.

After finishing, remove the sample from the table and clean it with the cotton cloth (5.8). Remove also the used scrub material.

Store the samples for 24 h in the climate of (23 ± 2) °C and relative humidity of (50 ± 5) %.

Carefully examine the test surface with light coming from all directions for scratches using the scheme according to Annex B. For this purpose, illuminate the surface separately using the diffuse light source (5.3) and examine from different angles, including angle combinations such that the light is reflected from the test surface and towards the observer's eye. Viewing distance shall be (0,3 ± 0,05) m.

The visual assessment shall be done by observers experienced in visual assessments of surfaces. In a case of doubt, three observers shall assess.

If more than one observer has assessed the surface, calculate the mean value of the assessments for every sample and round it on the next integral number.

Calculate the mean value of the three samples and round it on the next integral number.

9 Test report

The test report shall include at least the following information:

— reference to this European Standard;

— description of the laminate floor coverings which the samples were taken from (if possible);

— the test temperature or temperatures;

— conditioning time;

— the mean values and classes for the results of the test according to procedures A and B with 8.2;

— any deviations from this European Standard;

— name and address of the test facility;

— date of the test.

Annex A
(normative)

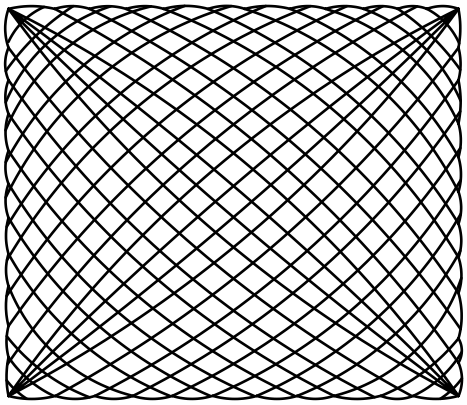
Method for checking the Lissajous figure

Obtain the Lissajous figure for each workstation by means of the following method:

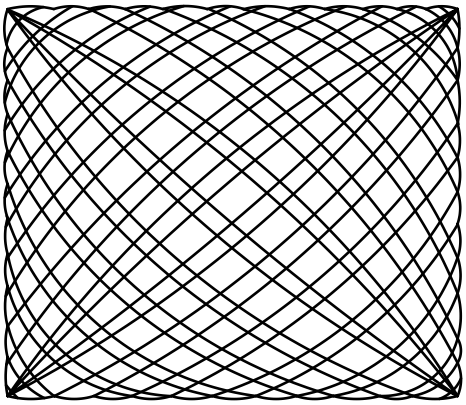
Remove materials from the abrading tables. Cover each abrading table surface with a plain paper measuring (100 ± 5) mm in diameter of minimum mass per unit area 100 g/m² and secure paper to abrading table ensuring the surface is perfectly flat.

Insert a steel sleeve of the same diameter as the specimen guide spindle counterbored to accept the introduction of a refill from a typical ballpoint pen through each of the specimen holder spindle bearings in turn in the specimen holder guide plate, so that the ball tip is resting on the surface of the paper. Set the machine for 16 rubs to produce one complete Lissajous figure.

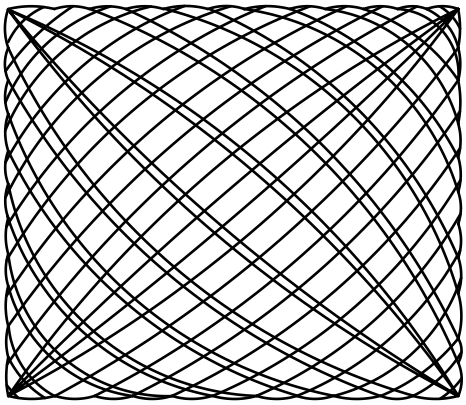
Draw two parallel lines which just touch the outermost curves on two opposing sides of the Lissajous figure. Draw two more parallel lines for the other two sides making sure the lines intersect at right angles. Measure each side to an accuracy of ± 0,2 mm using suitable means. Check that 31 curves are drawn. It is important to check the symmetry of the Lissajous figures. If the curves run into one another or if the spacing is uneven (see Figure A.1), consult the machinery supplier.



a) acceptable



b) unacceptable



c) unacceptable

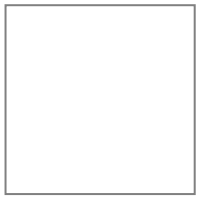
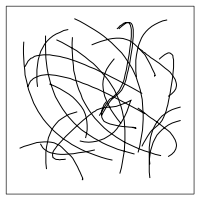
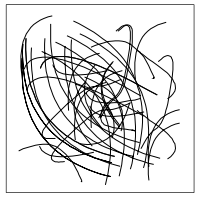
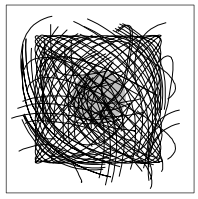
Figure A.1 — Examples of acceptable and unacceptable Lissajous figures

Annex B
(normative)

Classification of the image after scratching according to procedure B

For the visual assessment of the surface after scratching according to procedure B, the classification given in Table B.1 shall be used.

Table B.1 — Classification for visual assessment according to procedure B

Resistance class	Scratch picture	Explanation
MSR-B1		No visible scratches
MSR-B2		Only few scratches
MSR-B3		Many well visible scratches
MSR-B4		A great many well visible raw and fine scratches, Lissajous figure partly visible
MSR-B5		Mix of Lissajous figure and great many scratches, mat abrasion like area in the middle

Bibliography

[1] EN ISO 3668:2001, *Paints and varnishes – Visual comparison of the colour of paints (ISO 3668:1998)*

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™